Research Office
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Research Project Title

RES2021-14 Seismic Monitoring for Asset Management and Prioritization of Transportation Infrastructure

Purpose of the Project

While bridges in western Tennessee have been designed and/or retrofitted to withstand some seismic activity due to concerns for the New Madrid Fault, it is more challenging to make approaches resistant to impacts of liquefaction and seismic waves. Damages to bridge and/or overpass approaches could render bridges useless for evacuation and/or response activities. Therefore, employing low-cost sensing to monitor ground motion in the vicinity of bridges throughout the region could be valuable to inform decision making for response and asset management. Direct sensing and analytics could be utilized at bridges and in the surrounding areas (i.e., approaches and nearby slopes) with connections to existing communication networks to help identify and prioritize where significant ground movement has occurred that may require field response. Low-cost sensing can help offset the cost of labor and time for crews to physically visit and inspect bridges and approaches, especially along evacuation routes in the aftermath of an event. Review of frequency and severity of seismic waves can also provide insight to prioritize locations of other assets for health monitoring damage estimation following an event to improve public safety and return those assets to operational status.

Scope and Significance

This research project will review and identify the optimal types/configuration of low-cost direct sensors for field data collection, establish best practices for their deployment, and develop a protocol to prioritize the data coming from the sensors to prioritize field team resources for inspections and response during and/or after seismic events through

1. Reviewing State DOT and USDOT policies of asset management requirements for assets at risk to seismic activities and verify policies that best inform risk-based data approaches to decision-making and safety
2. Identify locations for pilot test deployment.
3. Conduct a literature review on sensing options and economic feasibility.
4. Develop specifications for hardware and electronics through lab testing.
5. Prepare a prototype sensor.
6. Deploy 3-4 sensors for Phase-I testing for proof-of-concept.
7. Collect data from deployed sensors.
8. Develop a technology report and a final project report.

Expected Outcomes

1. Developing an approach and prototype for collecting low-cost, directly sensed data on ground motion with a focus on bridges and approaches to better detect and prioritize transportation assets that may have potential damages due to seismic activities.
2. Deploying and testing the prototype through a small network of deployed sensors in Western Tennessee as a Phase-I test application.
3. Identifying best practices and recommendations for scale-up of a direct-sensing network for

improved management of transportation infrastructure in seismically active areas.

4. Developing a report that identifies benefits of low-cost, directly sensed asset health monitoring and public safety that enables increased ways for compliance with Federal and State policies, and therefore, increases resilience for Tennessee Transportation Infrastructure.

Time Period

March 2021 to February 2022

Contact Information

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